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TRIP B-4

THE TIMING OF THE ALPINE GLACIATION OF MT. KATAHDIN

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INTRODUCTION

Mt. Katahdin is the highest mountain in Maine (1605m) and, with a local relief of about 1450 meters, is one of the largest mountains east of the Rocky Mountains. Griscom (1966) provides an excellent summary of the early ascents and geologic exploration of Mt. Katahdin. The mountain is composed of granite and is part of a large Devonian pluton that intrudes lower and middle Paleozoic sedimentary and volcanic rocks. Mt. Katahdin is part of a large massif in the northernmost 15 percent of the area of the whole pluton. The rest of the pluton consists of rolling hills of no more than 200m relief. Hon (1980) points out that most of the pluton consists of coarse granite without an interlocking texture which readily disintergrates to grus. Hon goes on to say that only where the main granite body is covered by a fine grained summit facies rock with a tough, interlocking texture do mountain occur within the Katahdin pluton.

Erratics found by Tarr (1900) and Antevs (1932) near the summit of Mt. Katahdin and by Caldwell (1972) on other mountains in the region support the view that Mt. Katahdin was covered by continental ice sometime in the Pleistocene. There is no direct evidence that the highest elevations were covered by Late Wisconsin ice, although theoretical ice profiles constructed by Davis (1978) suggests that they were.

The purpose of this field trip is to review evidence for and against late Wisconsin Alpine Glaciation on Mt. Katahdin. Caldwell (1959, 1966, 1972, 1980, 1982) has long held that Alpine Glaciation did occur within the late Wisconsin. Davis (1976, 1978, 1983; Davis and Davis, 1980; and Davis and others 1980) has proposed that there is no concrete evidence for late Wisconsin Alpine Glaciation. In this field guide ideas held by Caldwell will be so identified while the views of Davis will also be indicated.

FEATURES FORMED BY ALPINE GLACIATION

Cirques

In the Mt. Katahdin area cirques occur only on those mountains underlain by Katahdin granite. Most of the cirques (6-7) were formed on the massif which includes Mt. Katahdin and the other high peaks which lie above timberline. The 3 largest cirques are on the east side of the mountain and have headwall heights which range from 720 meters to about 100 meters. These 3 great cirques have flat to concave floors and steep headwalls composed largely of bedrock. Postglacial rockfall and avalanche debris does mask the lower slopes of the cirque headwalls and sidewalls. The total aspect of these cirques is one of remarkable freshness, especially when compared with other cirques in northeastern United States assumed to be occupied by glaciers in the late Wisconsin (Wagner, 1970; Craft, 1979; Bradley, 1981).

Aretes

The 3 east-facing cirques are separated by aretes. The most typical arete is Hamlin Ridge, which separates North Basin cirque from Great Basin cirque (Figure 1). The arete which separates Great Basin cirque and South Basin cirque, Cathedral Ridge, has been shortened and lowered by glacial erosion and mass wasting. The most spectacular serrate mountain crest is the Knife Edge, but it may not technically be an arete because there is no cirque on its south side. However, the long narrow saw tooth ridge crest and the over 2000 foot (720m) drop into South Basin more than make up for this deficiency.

Moraines

The aspect of alpine glaciation on Mt. Katahdin about which there is the greatest controversy concerns moraines found within and down the mountain from the three largest cirques. Tarr, 1900; Antevs. 1932; and Caldwell, 1959, 1966, 1972 and 1980; identified moraines in each of these cirques. In addition these authors believed the large Basin Ponds moraine was a medial moraine formed between the combined alpine glaciers from the three cirques and the still active tongue of the Laurentide ice sheet. The common interpretation was the alpine glaciers which formed these moraines were both contemporaneous with (at the Basin Ponds Moraine), and postdated (at the moraines with the cirques), the Late Wisconsin ice sheet. Davis (1976, 1978, 1983) believes that the Laurentide ice sheet covered Mt. Katahdin during the Late Wisconsin but that no alpine glaciers postdated the ice sheet glaciation. Davis does not believe that there are moraines within the large cirques and interprets the Basin Ponds Moraine to be a lateral rather than a medial moraine. Davis and Davis (1980) and Davis and others (1980) suggest a piping mechanism to explain the lengthy lag times between deglaciation and accumulation of datable organic material on alpine bog and pond bottoms.

Davis views a glacial sequence for Mt. Katahdin similar to that proposed by Goldthwait (1970) for the Presidential Range in New Hampshire. The features discussed here are located in Figure 1 which also shows the location of field trip stops.

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Figure 1. Vertical aerial photograph made from a false-color image, courtesy of Baxter State Park Authority. North is at top of photo. Scale is about 1cm = 1.3km. Numbers refer to locations of field trip stops. Letters refer to features discussed in text: A. Terrace-like features on south side of the mountain, B. Basin Ponds Moraines, C. Baxter Peak, elevation 1605m.

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ITINERARY

Road Mileage	
0.0 Stop 1	The Katahdin quadrangle covers the area of this field trip. Field trip will assemble at 8:00 A.M. at Abol Crossing, at west end of bridge over West Branch Penobscot River. Park in gravel pit on east end of bridge and walk to west end of bridge. From this point we can view terrace-like features on south side of mountain. Davis believes these are lateral moraines, Caldwell believes they are Kame terraces. Evidence for both points of view will be discussed. In foreground is part of an area (3000 acres) burned during 1976 forest fire. Collapsed outwash and ice contact deposits lie below prominent ridge.
	Return to cars where brief discussion of the rock types found in the drift in this area. These play a large role in today's discussions.
0.1	Bear left on State road.
3.6	Turn left onto Baxter State Park road.
4.8	Togue Pond Camps. A basal radiocarbon date of 11,630 $\pm$ 260 yrs. B.P. (SI-2992) from Lower Togue Pond (east side of road) provides a minimum age for deglaciation of this part of the lowland surrounding Mt. Katahdin (Davis and Davis, 1980)
5.1	Park entrance. No pets, guns, shovels or pick axes allowed in park.
5.2	Turn right on Roaring Brook Road - road to left is built on a large esker that extends back to Abol Crossing.
7.0	Rum Brook.
10.2	Windey Pitch. Caldwell (1980) feels that this ridge is an end moraine because there are no bedrock exposures. However, Davis (unpubl. data) interprets this feature as a large mound of hummocky ground moraine, probably overlying a bedrock knoll.
11.0	Avalanche Brook and Avalanche Field.
13.6	Roaring Brook Campsite and Roadhead. Bear left and park in designated area. Secure cars.

Trail Mileage	
0.0	Trail log from Roaring Brook. Approximate mileage and hiking times do not include time at stops.
0.05	Bear right over bridge onto Sandy Stream Pond Trail.

0.6 (15 Mins.) — Stop 2 Sandy Stream Pond. From this vantage we can compare the aspects of the Basin Pond Moraine with the features seen at Abol Crossing. Also we can see into the large east-facing cirques, should the weather deteriorate before we get there. We also may see a Maine moose or two feeding. Return to Roaring Brook.

1.1 (30 Min.) — Turn right onto Chimney Pond Trail

2.9 — Stop 3 Outlook to right of Roaring Brook Trail about 100 meters beyond Halfway Rock (half way between Roaring Brook and Chimney Pond campsites). The sandy drift exposed at the Outlook has a noticeable content of erratic pebbles (40-60%, Davis, 1976). The small ridge dams a small bog with a basal radiocarbon age of 7070 ± 90 yrs. B. P. (SI-1049; Davis and Davis, 1980). This basal date and other radiocarbon dates from lake-bottom sediments on Mt. Katahdin are believed to be 5000 to 9000 years more recent that the time of deglaciation for reasons that will be discussed at Stop 9, Dry Pond. Davis (1976) believes that the small ridge at the Outlook is a recessional moraine formed by a shrinking mass of ice located in the lowlands south and east of Mt. Katahdin. However, Caldwell feels that the ridge could have been formed by cirque ice that overran the Basin Ponds Moraine just above (west) of here. Figure 1 shows location of Stop 3 and other stops which are identified by number on the photograph.

3.1 (1 Hr.-30 Min.) — Stop 4. Basin Ponds. The Basin Ponds Moraine (Figure 1, locality 4) dams the Basin Ponds, as well as numerous other smaller ponds on the east side of Mt. Katahdin. Because nearly all boulder size material in the moraine is composed of Katahdin quartz monzonite, Caldwell infers that the Basin Ponds Moraine was deposited by ice issuing from the 3 cirques to the west and overriding the continental ice here. However, Davis (1976) identified pebbles (2-5 cm, median axis), finding erratic compositions up to 28%. Moreover, the Basin Ponds Moraine extends both north and south well beyond the mouths of the 3 cirques, wraps tightly around Keep Ridge to the south (visible from Stop 3, Blueberry Knoll), and does not drop in elevation north to south, but remains within 2400- to 2500- feet contours. Taken together with the lateral moraines on the south slope of Mt. Katahdin, and up to 6% content of erratic red shale pebbles found in both moraines but not elsewhere on Mt. Katahdin, Davis (1976) infers that the Basin Ponds Moraine was formed by an ice advance from the lowlands to the southeast.

The red slate to which Tom refers is the Capens formation, a Silurian red and green slate, that occurs in the Frost Pond area, 18 miles nearly due west of where we were and in the Allagash Lake area, more than 50 miles northwest. One would want to find evidence other than red slate before posulating an advance from the southeast, where no known outcrops of red slate occur (Caldwell).

A basal radiocarbon date of 5665 ± 110 yrs. B. P. (I-7348) from Lower Basin Pond probably is at least 7000 years more recent than the time of deglaciation.

3.4 (Hr. 45 Min.) North Basin Cutoff Trail.

4.1 Stop 5. Blueberry Knoll and North Basin cirque. Blueberry Knoll is at the mouth of a cirque with the least vegetated floor of any cirque in New England (Figure 1, locality 5). Caldwell believes that Blueberry Knoll is an end moraine deposited by a cirque glacier; however, Davis feels that the shape of the knoll and seismic data suggest a bedrock origin. Davis (1976) found up to 15% content of erratic pebbles on Blueberry Knoll, suggesting meltout from continental ice. Blueberry Knoll not only offers fine views of North and South Basin cirques, but also an excellent view of the Basin Ponds Moraine and associated hummocky topograph to the east and south.

Proceed along trail to middle of North Basin Cirque.

4.4 (3 Hrs.) Stop 6. North Basin Cirque. Two small ponds occur in prominent basin with ridge of bouldery moraine (Caldwell) beyond, near head of cirque is an irregular hommocky mound of debris that Caldwell (1959, 1972) described as a pro-talus rampart but may be a rock glacier. Return to Blueberry Knoll.

4.7 (3 Hrs.- 30 Mins.) Blueberry Knoll. Return to trail.

5.0 (4 Hrs.) Hamlin Peak Trail up Hamlin Ridge. Although hiking up this ridge to Hamlin Peak would provide spectacular views of features under discussion, there will not be time and still have the last two stops. It should be realized that it would take about 3 1/2 hours to reach Hamlin Peak and return to Chimney Pond and it will be getting dark by then.

5.6 (4 Hrs. 30 Mins.) Stop 8. Chimney Pond. A classic tarn provides a spectacular view of the 2000- ft. cirque headwall of South Basin. A basal radiocarbon date of 3050 ± 90 yrs. B. P. (I-7347) is believed at lest 9000 years more recent than the time of deglaciation of South Basin cirque. Although low percentages of erratic pebbles occur in Great and South Basins, large erratic cobbles are present.

6.1 (4 Hrs. 45 Mins) Stop 9. Dry Pond. This depression of boulders holds water only for a few days during spring snowmelt or after intense rainstorms. Fine material is flushed out through cavities among the large boulders on its floor. A similar flushing probably occured during early stages of formation of other bogs and ponds on Mt. Katahdin, thus explaining the extremely minimum-limiting nature of basal radiocarbon dates. Caldwell interprets Dry Pond as a

depression behind a cirque glacier end moraine; however, Davis did not find a ridge in the forest suggestive of a moraine. Numerous large erratic cobbles are found in trail cuts between here and Basin Ponds.

9.4 (6 Hrs.) Roaring Brook campsite and end of trip.

- Thank you -